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ABSTRACT

Viewing computers in various forms as developmentally appropriate objects for children, this discussion provides a framework for integrating conceptions of computers and conceptions of play. Several instances are cited from the literature in which explicit analogies have been made between computers and playthings or play environments. Subsequently, computers are considered with regard to three qualities or dimensions of playthings: responsiveness, complexity, and versatility. Play in this context refers to assimilative activity characterized by intrinsic motivation, internal locus of control, and internal reality--in other words, activity that proceeds by relaxation of the effort at adaptation. From this perspective, the role of computers in children's play is discussed in terms of Piaget's classification of the structures of play as they arise ontogenetically: practice play, symbolic play, and games with rules. It is concluded that, in early childhood education settings, there is no more inherent conflict in providing young children with computers as playthings than there is in providing them with conventional playthings. (RH)

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Computers and Play[1]

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Computers and Play

Introduction

This is an exciting time to be an educator. Simultaneously we acquire a marvelous educational tool, the microcomputer, and we bask in the attention brought on by the publication of A Nation at Risk (National Commission on Excellence in Education, 1983). It is natural to ask, "Can computers contribute to excellence in early childhood education?" It is tempting, too, to focus on the instructional potential of computers with regard to basic cultural (read academic) skills. I have chosen a different exercise, however, namely to explore the potential contribution of computers to young children's play from infancy through primary school age. The educational value of play hardly needs to be argued in this context, but skeptics may refer to Sutton-Smith (1975), Barell (1980), and Caplan and Caplan (1974) for perceptive views on the importance of play for younger children, older children, and the human species, respectively.

What's to be gained from such an exercise? First, I have sought a conceptual framework for integrating conceptions of computers and conceptions of play, since such

efforts could guide the integration of computers with more established early childhood education practice. Second, I wish to convey a certain flexibility in thinking about computers (in various forms) as developmentally appropriate objects for children. "The computer," as it is generally referred to in the abstract, is truly a chameleon (to use a metaphor made prominent by the Center for Children and Technology at Bank Street College of Education). Newson and Newson (1979) categorized playthings as body-extending, realistic, hypnotic, role-play, and mind-expanding. "The computer" can serve as any of these types of playthings except, perhaps, as a body-extending plaything (such as a swing) as envisioned by those authors. Computers do serve body-extending functions for some handicapped persons, although not, typically,in the manner of playthings. In this context is is worth singling out the work of Meyers (forthcoming), who has had striking success in getting very young non-speaking handicapped or developmentally delayed children to begin speaking by means of play sessions organized around a computer equipped with a speech synthesizer, graphic displays, and a touch-sensitive keyboard.

Playful Uses of Computers

We are all familiar with instructional computer applications in early childhood education, such as matching games involving concepts and symbols, arithmetic drills, and programming with Logo and BASIC. Further, we tend to instantiate the concept of "computer" with an image of a typewriter keyboard and a television screen, with perhaps a disk drive and a printer alongside. Such a conception of computers and their uses implicitly underlies the criticism of Barnes and Hill (1983), for example.

Using computers for traditional instruction, it is maintained, is not appropriate for children who are not well into the concrete operational stage of cognitive development. Such a Piagetian analysis of computer use is rather popular (Barnes and Hill, 1983; Favaro, 1983; Williams, 1983) Barnes and Hill (1983) add the argument that using computers involves too little physical activity to be appropriate for preschool children. These arguments merit consideration, but I believe that they may be based on a limited conception of the variety of ways one can arrange for children to interact with computers. Think for example, of touch tablets, joysticks, light pens, touch screens, speech synthesizers, mice, and robots. For young children we have to think about "getting the computer off its chassis," so to speak. We already have Simon, Big Trak,

Speak & Spell, the Petite Talking Typewriter, and Topo.[2]

There are several instances in the popular and professional literature on computers and young children where authors have made explicit analogies between computers and playthings or play environments. TLC founder Piestrup envisions young children's interactions with software that "resemble sandbox play" (Green, 1983, p. 168). In another recent article, Piestrup expresses the desire for children to see the computer "as a friendly partner in a mental playground" (Rheingold, p. 42). Weyer (1983) compares the computer to a set of building blocks. Ziajka (1983) sees the computer as an electronic easel. Hefter, who designs the Stickybear[3] software, sees the computer as a bridge between printed materials and toys, since the computer allows the child to play with text, so to speak (Raleigh, 1983). Borg and Dickson (1983) observed preschool children addressing a computer as "you", projecting upon the machine the role of a (sometimes recalcitrant) playmate. Paul's (1983) article is interesting (although it is not really about play) if only for the observation that the author's two-year-old daughter apparently learned the alphabet as "Q, W, E, R, T, Y..."

Papert (1980) conceived of mathematical microworlds basically as a form of play space. The Logo turtle's microworld was designed for what Papert calls "Piagetian learning" or "learning without curriculum." By putting the turtle under the child's control, Papert in a sense made it the child's plaything. (See also Lawler, 1982.)

While Papert was in Geneva with Piaget, Moore was developing autotelic learning environments, including what was to become known as the talking typewriter. Moore (1980), too, was deliberately attempting to capitalize on the power of play:

> Whereas most of those concerned with computers two decades ago conceived of them as highly efficient and faithful master clerks, we were trying to show their potential for enhancing human growth, especially the kind of growth that arises out of playfulness. (p. 15)

After the preceding rather informal excursion through some views about play and computers, I would like to concentrate now on what roles computers might conceivably play in children's play from the perspective of formal theory about play. After a brief introduction to some important dimensions of playthings, I will then relate these to roles for computers in different types of play.

Dimensions of Playthings

There are at least three dimensions or qualities of playthings which are likely to be the capital ones to

consider in a discussion of computers and play. The dimensions are responsiveness, complexity, and versatility. I have not forgotten novelty, but as a temporal quality it seems less critical than the others.

Responsiveness -- on the part of people as well as objects -- is what allows children to learn about control and causation. Computers are nothing if not responsive (which is their great advantage over books and television). While microprocessor-based toys have great potential with regard to responsiveness -- i.e., giving the child control over a variety of outputs via a variety of inputs -- the complexity of the input and output must be given careful thought. Consideration of the complexity of the input process -- conceptual as well as motoric -- apparently led Perlman (1974) to create the "add-on-able" button boxes of TORTIS. Similar considerations would lead us to prefer touch tablets, joysticks, small keypads, and the like, for young children.

McCall (1974) studied the effect of configural complexity on infants' exploration of playthings and found no effect. This is in contrast to Switsky, Haywood, and Isett's (1974) results with preschool-age children; they found an increasing preference for complex shapes with age. McCall (1974) also studied the effects of responsiveness, or "potential for contingent and/or conjugate stimulation" (p. 35), specifically in the forms of plasticity and sound potential; these had marked effects on the infants'

exploratory behavior at about ten months of age. McCall (1974) subsumed responsiveness under "general complexity" and "varied information potential" (p. 44), this information being viewed as feedback to the child. McCall (1974) noted that the potential feedback of a plaything must match the perceptual-cognitive development of the child to actually serve as feedback (p. 78). How much complexity (with regard to manipulation and feedback) can be tolerated without frustration may be a direct function of age.

Versatility refers to the way a toy lends itself to being subordinated to a variety of fantasies or purposes by the player. The versatility of a plaything is bound up with its realism. Smilansky (1968) considered realistic toys, or replicas, to be at the same time emotionally satisfying, because they allow the child to feel s/he is really behaving like an adult, and also limiting, because their use is largely predetermined. Raabe (1980) offered a similar objection to all industrially made toys. Smilansky (1968) also observed that, among her subjects, advantaged children preferred undefined or ambiguous objects as playthings in their sociodramatic play, while disadvantaged children preferred more realistic props.

Smilansky's observations were validated to some extent by Pulaski's (1973) results with upper-class children a few years older. Instead of "advantaged" and "disadvantaged," Pulaski used "low fantasy disposition" and "high fantasy disposition" as independent variables. Both types of

children played with "high structure" toys and "minimal structure" toys. Although the interaction was not statistically significant, high fantasy children showed more positive affect with minimal structure toys while low fantasy children showed more positive affect with high structure toys. And high fantasy children engaged in more fantasy play with minimal structure toys, while low fantasy children's fantasy play did not differ with minimal and high structure toys.

At bottom, versatility may not be entirely an inherent dimension of playthings but rather a function of the creativity (inventiveness, divergent thinking ability) of the user. This notion has been expressed in a remark attributed by Newson and Newson (1979) to a British toy designer: "Anything is a toy if I choose to describe what I am doing with it as play" (p. 13).

Computers and Types of Play

Play in this paper refers to assimilative activity (Piaget, 1962) which is characterized by "intrinsic motivation, internal locus of control, and internal reality" (Neumann, 1971) and which "proceeds by relaxation of the effort at adaption" (Piaget, 1962). Identical behaviors can be playful or not, depending on whether or not the above

criteria are met. For example, not all imitative behavior is playful, but play can include imitation. Exploration, which is accommodative, is not play, but is a usual -- even necessary -- antecedent to play (Hutt, 1971). Piaget (1962) classified the structures of play as they arise ontogenetically as practice play, symbolic play, and games with rules; the same classifications will be used here.

Practice play. In practice play it is sensorimotor schemata which are practiced. What role could computers serve in the practice play of young children? According to Newson and Newson (1979), infants and toddlers get special pleasure from "making things happen" (p. 14). Micro processors are excellent devices for making things happen in response to relatively simple actions. Victoria Williams, who directs a private learning center in a suburb of Los Angeles, has placed VIC-20 computers and software in homes where infants and toddlers are encouraged and helped to manipulate a joystick to control color, sound, and movements on a TV screen. (Speech output is not included but could be.) She will discuss her project in her forthcoming book, How to Teach Your Baby to Use a Computer (Bantam, fall 1984). I can't resist mentioning at this point that Hutt's (1971) experimental apparatus back in 1966 resembled nothing so much as an oversize joystick. It is at least possible to imagine today small, squeezable, colorful microprocessor-based toys with responsive lights, sounds, speech, and even "cute" movements.

The prospect of computer-based crib toys -- automated busy boxes, blinking mobiles, talking Teddy bears, and the like -- does not warm the hearts of all early childhood specialists, however. Newson and Newson (1979) probably speak for a large number of them as follows:

> [...] even a very sophisticated computer would provide at best a mediocre substitute for an attentive human caregiver who reacts to a baby sensitively and with anticipation in the light of what he has been able to do in the past or seems about to do in the next few moments. (p. 29)

Clearly, they seem to be saying, there is the responsiveness of machines, and then there is the responsiveness of human care. Presumably, one difference, which children could be expected to sense, is "emotional investment." Tittnich and Brown (1982) have similar misgivings about making children's playthings too seductive via technology. As with most computer-based innovations concerning young children at this time, the yellow light is on -- proceed with caution.

Symbolic play. In many preprimary classrooms we can find unwired telephones, gutted televisions, play stoves and refrigerators, toy cash registers, etc. Why not a mock computer? By providing such a prop for pretend play, we

could gain a window onto children's conceptions about computers. In addition to providing a prop for make-believe play, providing an operating computer as a medium for such activities as "painting" or music composition also affords children opportunities to engage in symbolic play. Howe (1983) discusses "model building" with the aid of a computer. Here model bulding means constructing something out of basic parts, much as an Erector set or Legos® might be used. Howe (1983) notes that toy model designers decompose the model into parts, while the child composes the model from the parts. He states,

> What we want, therefore, is a symbolic system where a child can combine the skills of the designer with those of the assembler, for example a picture-drawing system, a tune-composing system, or a sentence-generating system. A child can explore drawing problems, tune-composing tasks, and so on, through working with such a system because it provides a special language for talking about the <u>process</u> of drawing, the <u>process</u> of composing, or the <u>process</u> of sentence construction, where this process is a top-down problem-solving process. (p. 76)

Kay (1977) seems to have had just such a conception of computer use in mind in inventing the SMALLTALK language. As SMALLTALK becomes more widely available, it could rival Logo as a programming language for children. (See also Lesgold, 1983, p. 179.)

It may be that the realm of symbolic play is where programmable robots could serve as vehicles for children's developing programming concepts in a playful mode which then would provide scaffolding for programming applications in nonplay contexts. While children would probably focus on the robots' potential for thematic play, they may incidentally learn programming concepts as they learn to operate the toys. I am not aware of any research with such objects as the mechanical Logo turtle or Big Trak which takes this particular perspective. Keller and Shanahan (1983) list the instructional objectives which guided one project involving Big Trak in a kindergarten, but it is not clear whether or not they allowed the children to use it playfully.

Games with rules. Games represent the oldest -- and perhaps still the most prevalent -- form of play with computers. Until a year or so ago, the initial form of computer use by most young children was likely to be a video game. Regarding the design of educational computer games, Malone (1983) distinguishes "extrinsic fantasy" from "intrinsic fantasy." One way to describe the distinction briefly is to say that with intrinsic fantasies, skills are

used in a "real world" way (e.g., in simulations), whereas with extrinsic fantasies, the fantasy serves merely as reinforcement for the "dissociated" practice of skills (e.g., in hangman- and space invasion-type games). In other words, solving equations has nothing to do intrinsically with being eaten by alligators, say, or racing cars, but it does have something to do intrinsically with making a profit or determining a trajectory. Malone considers intrinsic fantasy to be better for learning.

Other forms of video games of course include electronic, two-dimensional versions of board games and card games, as well as sports. Whether playing such games on a representational level has the developmental consequences described by Piaget (1962) is an open question, I believe. The dearth of group games for computers has been cause for concern. The Children's Computer Workshop is currently working on computer games which stimulate communication and cooperation among multiple players (see Rhein, 1983).

Conclusion

In light of the foregoing discussion, it appears -- on a very general level -- that if we want to think about computers (in various forms) as playthings, we can think about how they lend themselves to 1) being explored, 2) being subordinated to children's fantasies and purposes, and 3) providing engrossing gaming challenges -- with a very broad interpretation of gaming as an adaptive activity for "real life." There does not appear to be any more inherent conflict in providing children with computers-as-playthings -- and justifying it in terms of educational value -- than in providing children with the more conventional playthings which are already included in most early childhood education settings.

Footnotes

1. This is a revised version of a paper presented at the conference entitled "The Young Child and the Computer: Building the Future Together," sponsored by The Ohio State University College of Education's Department of Educational Theory and Practice, ERIC/EECE Clearinghouse, and the Micro Center, Columbus, Ohio, October 14-15, 1983.

2. Simon is a trademark of Milton Bradley.
Big Trak is a trademark of Milton Bradley.
Speak & Spell is a trademark of Texas Instruments.
Petite Talking Typewriter is a trademark of Byron International.
Topo is a trademark of Androbot.

3. Stickybear is a trademark of Optimum Resources.

4. Erector is a trademark of Gabriel Industries.
Lego is a trade mark of Interlego.

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